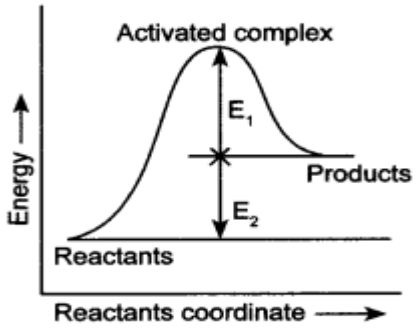
COMMON PRE-BOARD EXAMINATION 2022-23

Subject: CHEMISTRY (043)

Date:

General Instructions:

1. There are 35 questions in this question paper with internal choice.
2. SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 7 very short answer questions carrying 2 marks each.
4. SECTION C consists of 5 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

S.No.	MCQs	Marks
1.	The charge required for the reduction of 1 mol of MnO_4^- to MnO_2 is (a) 1 F (b) 3 F (c) 5 F (d) 6 F	1
2.	The rate constant of a reaction A → B is 0.6×10^3 mole per second. If the concentration of [A] is 5 M, then what will be concentration of [B] after 20 months? (a) 0.36 M (b) 0.72 M (c) 1.08 M (d) 3.60 M	1
3	If the initial concentration of reactant is doubled, $t_{1/2}$ is also doubled, the order of reaction is (a) zero (b) 1 (c) 2 (d) 3	1
4	Consider the following figure and mark the correct option.  	1

	(a) Activation energy of forward reaction is $E_1 + E_2$ and product is less stable than reactant. (b) Activation energy of forward reaction is $E_1 + E_2$ and product is more stable than reactant. (c) Activation energy of both forward and backward reaction is $E_1 + E_2$ and reactant is more stable than product. (d) Activation energy of backward reaction is E_1 and product is more stable than reactant.	
5.	Which of the following has magnetic moment value of 5.9? (a) Fe^{2+} (b) Fe^{3+} (c) Ni^{2+} (d) Cu^{2+}	1
6.	Which of the following can make a stable compound with a metal ion (a) oxalate (b) ethan1,2 -diammine (c) EDTA (d) SCN^-	1
7.	The complex ions $[Co(NH_3)_5(NO_2)]^{2+}$ and $[Co(NH_3)_5 (ONO)]^{2+}$ are called (a) Ionization isomers (b) Linkage isomers (c) Co-ordination isomers (d) Geometrical isomers	1
8.	Which of the following are arranged in the decreasing order of dipole moment? (a) CH_3Cl, CH_3Br, CH_2F (b) CH_3Cl, CH_3F, CH_3Br (c) CH_3Br, CH_3Cl, CH_3F (d) CH_3Br, CH_3F, CH_3Cl	1
9.	Phenol reacts with bromine in CS_2 at low temperature to give a) m-bromophenol b) p-bromophenol c) o-and p-bromophenol d) 2,4,6-tribromophenol	1
10.	The alcohol which does not react with Lucas reagent is a) isobutyl alcohol b) tert-butyl alcohol c) sec-butyl alcohol d) n-butanol	1
11.	The addition of HCN to carbonyl compounds is an example of (a) nucleophilic addition (b) electrophilic addition (c) free radical addition (d) electromeric addition	1
12.	Formaldehyde react with Grignard's reagent to give addition products which on hydrolysis give (a) tertiary alcohols (b) secondary alcohols (c) primary alcohols (d) carboxylic acids	1
13.	Which of the following: when heated with a mixture of ethanamine and alcoholic potash gives ethyl isocyanide? (a) 2-chloropropane (b) 2,2-dichloropropane (c) trichloromethane (d) tetrachloromethane	1
14.	Amine that cannot be prepared by Gabriel-Phthalimide synthesis is (a) aniline (b) benzyl amine (c) methyl amine (d) iso-butylamine	1
15.	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion (A): Cu and Zn are not considered as transition metal. Reason (R): Cu and Zn do not have their last electron in d orbital.	1

	Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
16.	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion (A): Assertion: With HI, anisole gives iodo benzene and methyl alcohol. Reason: Iodide ion combines with smaller group to avoid steric hindrance Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	1
17.	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion: Hoffmann's bromamide reaction is given by primary amines. Reason: Primary amines are more basic than secondary amines Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	1
18.	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion (A): Glucose produces n-hexane when reduced in presence of red phosphorus Reason: Glucose have a ketone group Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	1
	SECTION: B **This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.**	
19.	Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their Variation with change in temperature.	2
20.	a) Define rate of reaction b) Express the rate of the following reaction in terms of the formation of ammonia: $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	2
21.	Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life ($t_{1/2}$) of the reaction. **OR** A reaction is of second order with respect to a reactant. How will the rate of reaction be affected if the concentration of this reactant is (i) Doubled, (ii) reduced to half?	2

22.	a) Write IUPAC name for the compound: $[CoCl_2 (en)_2]Cl$ b) Out of the following two coordination entities which is chiral (optically active) and why? (1) cis-$[CrCl_2 (ox)_2]^{3-}$ (2) trans-$[CrCl_2 (ox)_2]^{3-}$	2
23.	a) Arrange the following in increasing order of boiling point: (i) $CH_3CH_2CH_2CH_2Br$ (ii) $(CH_3)_3.Br$ (iii) $(CH_3)_2C.Br$ b) Convert Propene to 1- nitro propane **OR** Give reasons: a) R-X reacts with KCN to give cyanides as major product and iso cyanides as major product with AgCN. b) Chloroform is preserved in dark-coloured bottles.	2
24.	a) Arrange the following compounds in an increasing order of their reactivity in nucleophilic addition reactions: Ethanal, Propanal, Propanone, and Butanone. b) Give a chemical test to distinguish between Ethanal and Propanal.	2
25.	a) Write a difference between a nucleoside and a nucleotide b) Vitamin C must be taken regularly in diet. Why?	2
	SECTION: C This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.	
26.	a) State Henry's law. b) The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5 g when added to 39.0 g of benzene (molar mass 78 g mol^{-1}). Vapour pressure of the solution, then, is 0.845 bar. What is the molar mass of the solid substance?	3
27.	a) The Complex $[Ti (H_2O)_6]^{3+}$ is a coloured compound. Justify. b) Explain: $[Co (NH_3)_6]^{3+}$ is an inner orbital complex whereas $[CoF_6]^{3-}$ is an outer orbital complex. c) Write the coordination number and oxidation number for Fe in the coordination entity $[Fe(CN)_6]^{4-}$ **OR** a) Explain on the basis of valence bond theory that $[Ni(CN)_4]^{2-}$ ion with square planar structure is diamagnetic and $[NiCl_4]^{2-}$ ion with tetrahedral geometry is paramagnetic. b) $FeSO_4$ solution mixed with $(NH_4)_2SO_4$ solution in 1: 1 molar ratio gives the test of Fe^{2+} ion but $CuSO_4$ solution mixed with aqueous ammonia in 1 : 4 molar ratio does not give the test of Cu^{2+} ion. Explain why?	3
28.	a) Which one of the following compounds will undergo faster hydrolysis reaction by SN1 mechanism? Justify your answer. $C_6H_5CH_2Cl$ or $CH_3CH_2CH_2Cl$ a) What happens when chlorobenzene reacts with Sodium hydroxide at 623K and 300 atm. pressure?	3
.29.	What happens when (Attempt any three) i) Propanone is treated with methyl magnesium bromide and the product is hydrolysed. ii) Two moles of Benzaldehyde are heated with concentrated NaOH. iii) 2,4 DNP is added to acetone. iv) Tert. butyl alcohol is heated with copper at 573K.	3
30.	a) Arrange the following in decreasing order of their basic strength: $C_6H_5NH_2$, $C_2H_5NH_2$, $(C_2H_5)_2NH$, NH_3 b) Why Aniline does not undergo Friedel-Crafts reaction?	3

	b) What happen when C_6H_5 (NH) CH_3 reacts with $CHCl_3$ and KOH?	
	SECTION: D The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow:	
31.	When a solution does not obey Raoult's law over the entire range of concentration, then it is called non-ideal solution. The vapour pressure of such a solution is either higher or lower than that predicted by Raoult's law. If it is higher, the solution exhibits positive deviation and if it is lower, it exhibits negative deviation from Raoult's law. The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis, i.e., to stop the passage of solvent molecules through a Semipermeable membrane into the solution. Osmotic pressure is colligative property as it depends on the number of solute molecules and not on their identity. For dilute solutions, it has been found experimentally that osmotic pressure is proportional to the molarity, C of the Solution at a given temperature T. Thus: $\Pi = C\ R\ T$ Here Π is the osmotic pressure and R is the gas constant. $\Pi = (n2\ /V)\ RT$ a) Define ideal solution. b) What kind of deviation is found in solution of alcohol in water? c) 200 cm^3 of an aqueous solution of a protein contains 1.26 g of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. Calculate the molar mass of the protein. OR Why Osmotic Pressure is used to measure the molar mass of biomolecules?	4
32.	The carbohydrates may also be classified as either reducing or nonreducing sugars. All those carbohydrates which reduce Fehling's solution and Tollens' reagent are referred to as reducing sugars. All monosaccharides whether aldose or ketose are reducing sugars. Fructose also has the molecular formula $C_6H_{12}O_6$ and on the basis of its reactions it was found to contain a ketonic functional group at carbon number 2 and six carbons in straight chain as in the case of glucose. It belongs to D-series and is a laevorotatory compound. It is appropriately written as D-(–)-fructose. Its open chain structure is as shown. Polysaccharides contain a large number of monosaccharide units joined together by glycosidic linkages. These are the most commonly encountered carbohydrates in nature. They mainly act as the food storage or structural materials. Protein found in a biological system with a unique three-dimensional structure and biological activity is called a native protein. When a protein in its native form, is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. a) Sucrose cannot reduce the Tollen's reagent. why? b) The optical activity of sucrose is changed to from dextro to leavo after some time. Explain it. c) What is denaturation of protein and which structure of protein remains intact during denaturation? OR What is the significance of D and L and + and - sign in sugars.	4
	SECTION: E **The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.**	

33.	(a) A cell is prepared by dipping a zinc rod in 1M zinc sulphate solution and a silver electrode in 1M silver nitrate solution. The standard electrode potential given: E^0Zn^{2+} / Zn = - 0.76 V, E^0Ag^+ / Ag = + 0.80 V What is the effect of increase in concentration of Zn^{2+} on the Ecell? (b) Write the products of electrolysis of aqueous solution of NaCl with platinum electrodes. (c) Calculate e.m.f. of the following cell at 298 K: Ni(s) / Ni^{2+} (0.01 M) // Cu^{2+} (0.1M) / Cu (s) [Given E^0 Ni^{2+}/ Ni = - 0.25 V , E^0 Cu^{2+}/Cu = + 0.34 V) Write the overall cell reaction. OR a) What is the role of zinc chloride in dry cell? b) /\m ° for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm^2 /mol respectively. Calculate Λ^o for HAc. c) Write the chemical reactions taking place at the electrodes during discharging of lead storage battery.	1+1+3=5 1+2+2=5
34.	a) Assign reasons for the following: (i) Copper (I) ion is not known in aqueous solution. (ii) Actinoids exhibit greater range of oxidation states than lanthanoids (iii) Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent. b) Complete the following chemical equations: (i) MnO_4^- (aq) + $S_2O_3^{2-}$ (aq) + H_2O (1) → (ii) $Cr_2O_7^{2-}$ (aq) + Fe^{2+} (aq) + H^+ (aq) →	3+2=5
35.	a) Arrange the following compounds in increasing order of their boiling points: CH_3CHO, CH_3CH_2OH, CH_3OCH_3 , $CH_3CH_2CH_3$ b) Would you expect Benzaldehyde to be more reactive or less reactive in nucleophilic addition reactions than propanal? Explain your answer. c) 4 Nitro benzoic acid is more acidic than 4- methoxy benzoic acid. Give reason. d) Explain the following reaction a) Aldol condensation 2) Etard reaction **OR** a) Arrange the following compounds in increasing order of their acidity: benzoic acid, nitro benzoic acid, methyl benzoic acid b) What happens when Phenyl magnesium bromide react with dry ice c) Write the reactions involved in the following: (i) Hell-Volhard Zelinsky reaction. (ii) Decarboxylation reaction. (iii) Wollf-Kishner reduction.	1+1+1+2=5 1+1+3=5

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